

## Syllabus for the examination

### Senior Court Assistant-cum-Senior Programmer

#### **Section A: Programming, Data Structures, Algorithms and Computation**

Programming using Python/ PHP/React frameworks such as Node.js, CodeIgniter, Laravel, etc; debugging, and optimizing code; Control structures, functions, recursion, exception handling; File handling, data processing; Code analysis, output prediction, and error identification; API consumption basics; handling JSON/XML data.; Arrays, Strings; Linked Lists, Stacks, Queues, Trees, Binary Search Trees, Binary Heaps, Graphs; Object-Oriented Concepts (Class, Object, Inheritance, Polymorphism, Abstraction, Encapsulation); Functions, Recursion, Parameter Passing, Scope, Binding; Sorting Algorithms, Searching Techniques; Greedy Algorithms, Divide-And-Conquer, Time Complexity, Space Complexity; Finite Automata, Regular Expressions, Context-Free Grammar, Pushdown Automata, Turing Machines; microservices architecture; DevOps practices and CI/CD pipelines.

#### **Section B: Database Management Systems**

Relational database concepts; Entity-Relationship Model, Relational Model; Structured Query Language (SQL) Queries, Joins, Subqueries, Views; Functional Dependencies; Normalization; Transactions, Concurrency Control; Indexing and query optimization basics; File Organization; NoSQL Databases; Internals of PostgreSQL; PostgreSQL, MySQL, MongoDB, Elasticsearch, OpenSearch; Database performance tuning and optimization; Indexing, vacuuming.

#### **Section C: Operating Systems**

Operating System Concepts; Processes, Threads; Central Processing Unit Scheduling Algorithms; Process Synchronization; Deadlocks (Prevention, Avoidance, Detection); Memory Management, Virtual Memory; File Systems; Basic shell scripting; System-level troubleshooting basics; Linux performance tuning and optimization.

#### **Section D: Computer Networks**

OSI and TCP/IP Model; Internet Protocol Addressing, IPv4 and IPv6, Subnetting; Routing Algorithms; Flow and Error Control; Transmission Control Protocol, User Datagram Protocol, Hypertext Transfer Protocol, HTTPS, Domain Name System; Network Devices (Router, Switch, Gateway); Wireless Technologies; Network Security Basics, Public Key and Private Key Cryptography, Digital Signatures, Firewalls.

#### **Section E: Software Engineering**

Software Development Life Cycle; Software Development Models; Software Design Concepts; Software Testing (Unit Testing, Integration Testing, System Testing, Regression Testing); Software Maintenance; Unified Modeling Language Diagrams; Data flow diagrams; Sequence diagrams; Gantt charts.

#### **Section F: Computer Organization and Architecture**

Number Systems, Conversions; Boolean Algebra; Logic Gates; Central Processing Unit Organization; Instruction Cycle; ALU and Data Path; CPU Control Design; Memory Interface, Cache, RAM, Secondary Storage; Input and Output Organization; Instruction Pipelining; Machine Instructions and Addressing Modes; Hardwired control flows; Microprogrammed control units; RISC and CISC processors.

### **Section G: Web & Mobile Technologies**

Web technologies (HTML, CSS, JavaScript basics); Client-server architecture; REST APIs and service interaction; Authentication and session handling; Common web vulnerabilities and prevention techniques; Android and iOS native programming; Cross-platform development using Flutter, React Native, etc.

### **Section H: Cybersecurity concepts**

Cybersecurity Principles (CIA Triad); Cryptography; Hashing, Digital Signatures; Network Layer Attacks (DoS, MITM, Phishing); Malware Types; Firewalls, IDS, IPS; Security Policies & Best Practices; Security Audits, Vulnerability Assessment, Penetration Testing; Secure Programming, OWASP Top 10; Application Security Fundamental; Encryption/decryption algorithms: AES, DES, 3DES; Hashing techniques: SHA, MD5; PKCS concepts; Secret sharing algorithms such as DHX.

### **Section I: Emerging Technologies and Information Technology Awareness**

Cloud Computing (Distributed computing, Hypervisors, Deployment Models, Service Models, Security); Artificial Intelligence, Machine Learning, Neural Networks; Big Data Concepts, Data Analytics; Internet of Things; Data Centre Security (Physical Security, Access Control, Virtualization Security, Backup and Disaster Recovery); Artificial Intelligence Security, Secure Artificial Intelligence Applications, Threat Detection, DevOps concepts CKD details, docker categorization and orchestration using Swarm/Kubernetes etc. Exposure to hyperwiser technologies like open stack, open shift VM wire, Proxmox, KVM etc.

## **Syllabus for the examination**

### **Junior Court Assistant-cum-Junior Programmer**

#### **Section A: Basics of computer programming**

Introduction to programming using simple languages such as Python, PHP, basic concepts like variables, data types, and input/output; Arrays, Strings; Linked Lists, Stacks, Queues, Trees, Binary Search Trees, Binary Heaps, Graphs; Object-Oriented Concepts (Class, Object, Inheritance, Polymorphism, Abstraction, Encapsulation); Functions, Recursion, Parameter Passing, Scope, Binding; Sorting Algorithms, Searching Techniques; Introduction to microservice architecture.

#### **Section B: Database Management Systems**

Introduction to databases; basic concepts of keys and relationships; normalization; overview of modern databases such as NoSQL; Database Concepts, Database Architecture; Entity-Relationship Model, Relational Model; Structured Query Language (SQL) Queries and Use of DBMS systems like MySQL, PostgreSQL, MongoDB, Elasticsearch, OpenSearch, etc.

#### **Section C: Operating Systems**

Operating System Concepts; Processes, Threads; Central Processing Unit Scheduling Algorithms; Process Synchronization; Deadlocks (Prevention, Avoidance, Detection); Memory Management, Virtual Memory; File Systems; Basic shell programming and Linux operating system commands and internals.

### **Section D: Computer Networks**

Introduction to computer networks; common networking devices like routers and switches; OSI and TCP/IP Model; Internet Protocol Addressing, IPv4 and IPv6, Subnetting; Routing Algorithms; Flow and Error Control; Transmission Control Protocol, User Datagram Protocol, Hypertext Transfer Protocol, HTTPS, Domain Name System; Network Devices (Router, Switch, Gateway); Wireless Technologies; Network Security Basics.

### **Section E: Software Engineering**

Introduction to software development; basic stages such as planning, coding, and testing; overview of simple development models; introduction to software testing and its importance; basic idea of software maintenance; Basic introduction to DevOps and CI/CD pipelines.

### **Section F: Computer Organization and Architecture**

Introduction to number systems such as binary and decimal with simple conversions; basic logic gates (AND, OR, NOT); overview of CPU and memory; introduction to input and output devices; understanding primary and secondary storage.

### **Section G: Web & Mobile Technologies**

Introduction to websites and web pages; basics of HTML and CSS; simple JavaScript concepts; understanding client-server interaction; basic idea of web security such as safe browsing and password protection; Android and iOS native programming and cross-platform using Flutter, React Native, etc.

### **Section H: Cybersecurity Concepts**

Introduction to cybersecurity and its importance; basic principles such as confidentiality, integrity, and availability; common cyber threats like viruses and phishing; safe internet practices; basic understanding of data protection.

### **Section I: Emerging Technologies and Information Technology Awareness**

Introduction to cloud computing; basic concepts of artificial intelligence and machine learning; overview of big data; introduction to Internet of Things (IoT); importance of data security and awareness of modern technologies; Introduction to blockchain.

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